INTERNATIONAL NIAGARA BOARD OF CONTROL

Burlington, Ontario
Cincinnati, Ohio

September 20, 2001

International Joint Commission
Ottawa, Ontario
Washington, D. C.

Commissioners:

1. GENERAL

The International Niagara Board of Control (Board) submits its Ninety Seventh Semi-Annual Progress Report, covering the period March 8 through September 20, 2001.

2. ITEMS OF INTEREST

For the months of March through August 2001, the level of Lake Erie continued below its long-term average. Precipitation on the Lake Erie basin was

generally below average during this period, and near record low in July. This contributed to the lake falling farther below average as the period progressed. Lakes Michigan and Huron also remained well below their long-term average levels during this period. This resulted in lower than average inflows to Lake Erie from upstream.

The Power Entities (Ontario Power Generation Inc. (OPG) and the New York Power Authority (NYPA)) complied with the Board's 1993 Directive for regulation of Chippawa-Grass Island Pool water levels throughout the reporting period.

Flow discharge measurements were conducted in the Welland Canal in March and at the Cableway Section of the Niagara River downstream of the Falls in April, 2001.

Below normal temperatures and lack of sunlight during March slowed the rate of ice dissipation on Lake Erie. Ice boom opening was delayed beyond April first as a result. Removal of the Lake Erie - Niagara River ice boom began on April 17, about 10 days later than average, and was completed on April 20, 2001.

The Buffalo and Fort Erie Public Bridge Authority has initiated a Bi-National Integrated Environmental Process. This is a planning process, with emphasis on public involvement, to consider capacity expansion of the Peace Bridge, U.S. Plaza and improvement of the connecting roadway system.

3. LAKE LEVELS

All elevations in this report are referenced to International Great Lakes Datum 1985. The values are expressed in metric units, with approximate English units (in parentheses) for information purposes only. The monthly lake level data are based on a network of four gauges to better represent the average level of the lake. Recorded water level and precipitation data for the period March through August 2001, and departures from long-term averages are shown in Tables 1 and 2 and depicted graphically on Figures 1 and 2.

During the months of March through August 2001, the level of Lake Erie remained below its long-term average. The level of the lake started the period 12 centimetres (4.7 inches) below average. It peaked in June with a mean of 174.10 metres (571.19 feet) which was 24 centimetres (9.4 inches) below average. In August the level was at 173.94 metres (570.67 feet), or 32 centimetres (12.6 inches) below average. Recorded water level data for the period March through August 2001 and departures from long-term averages are shown in Table 1 and depicted graphically on Figure 1.

The Lake Erie basin received approximately 40.3 centimetres (15.9 inches) of precipitation during the period March through August 2001. The period of record (1900–1996) average over this six-month period is 48.5 centimetres (19.1 inches). The departure from average over the six-month period was -17%. During this period only May received above normal precipitation, and that, at 24% above average, was significant. However, in July precipitation was near record low being 57% below the monthly average. Precipitation data for the period March through August 2001 and departures

from long-term averages are shown in Table 2 and depicted graphically on Figure 2.

Lakes Michigan and Huron remained well below their long-term average levels during this period. As a result, inflows to Lake Erie from the upstream lakes continued to be lower than average. Inflows from the upper lakes for the six-month period March through August 2001 were about 9 % below the long-term average.

As a reflection of the below average precipitation, water supplied to Lake Erie from its local drainage basin was generally well below average for the period March through August 2001, as can be seen in Figure 3.

The water level on Lake Erie naturally affects the outflow into the Niagara River. The continuing below average levels on the lake has caused Niagara River flows to remain below average. As the lake level falls farther below average, so does the outflow. The flows in the Niagara River are graphically depicted in Figure 4 and summarized in Section 6.

The September 2001 water level forecast indicates that the level of Lake Erie is expected to remain below its long-term average during the next six months.

TABLE 1 - MONTHLY AVERAGE LAKE ERIE WATER LEVELS

(Based on a network of 4 water level gages)

International Great Lakes Datum (1985)

	Metres			Feet		
Month	Recorded* 2001	Average 1918-00	Departure	Recorded* 2001	Average 1918-00	Departure
March	173.95	174.07	-0.12	570.70	571.10	-0.40
April	174.03	174.22	-0.19	570.96	571.59	-0.63
May	174.05	174.30	-0.25	571.03	571.85	-0.82
June	174.10	174.34	-0.24	571.19	571.98	-0.79
July	174.04	174.32	-0.28	571.00	571.92	-0.92
August	173.94	174.26	-0.32	570.67	571.72	-1.05

*Provisional

TABLE 2 - MONTHLY AVERAGE PRECIPITATION ON THE LAKE ERIE BASIN

	Centimetres			Inches			
Month	Recorded* 2001	Average 1900-96	Departure	Recorded* 2001	Average 1900-96	Departure	Departure in percent
March	4.37	7.01	-2.64	1.72	2.76	-1.04	-38
April	6.43	7.95	-1.52	2.53	3.13	-0.60	- 19
May	10.26	8.31	+1.95	4.04	3.27	+0.77	+24
June	8.00	8.71	-0.71	3.15	3.43	-0.28	- 8
July	3.66	8.43	-4.78	1.44	3.32	-1.88	-57
August	7.54	8.10	-0.56	2.97	3.19	-0.22	- 7

*Provisional

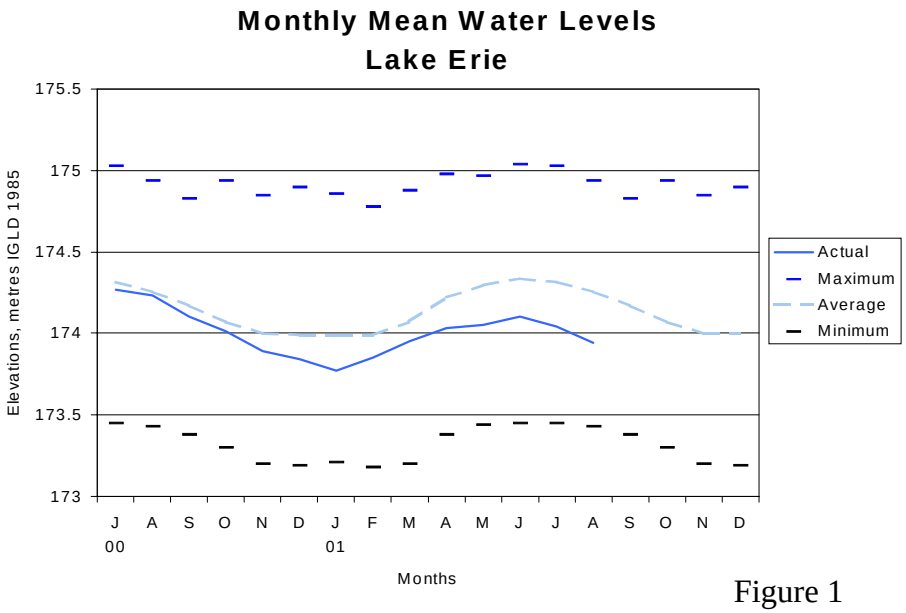

Figure 1

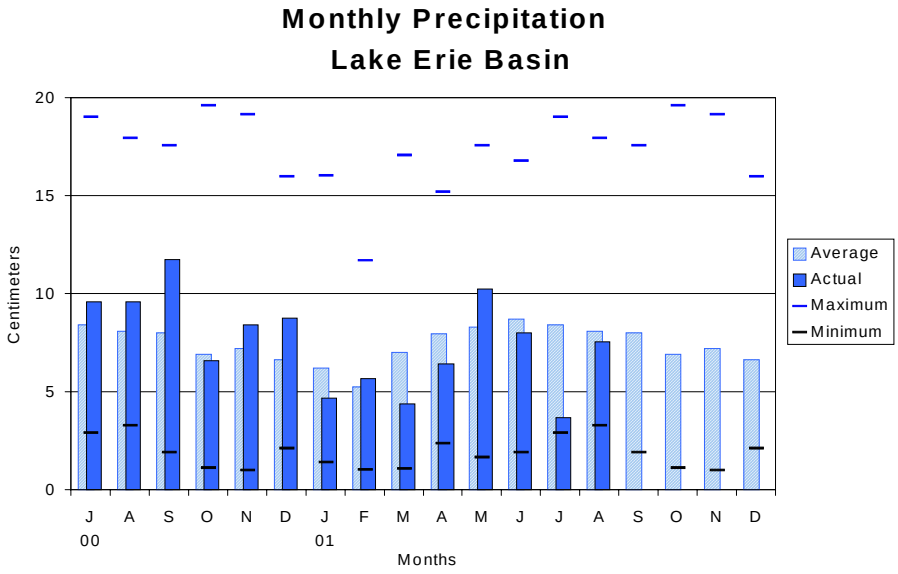

Figure 2

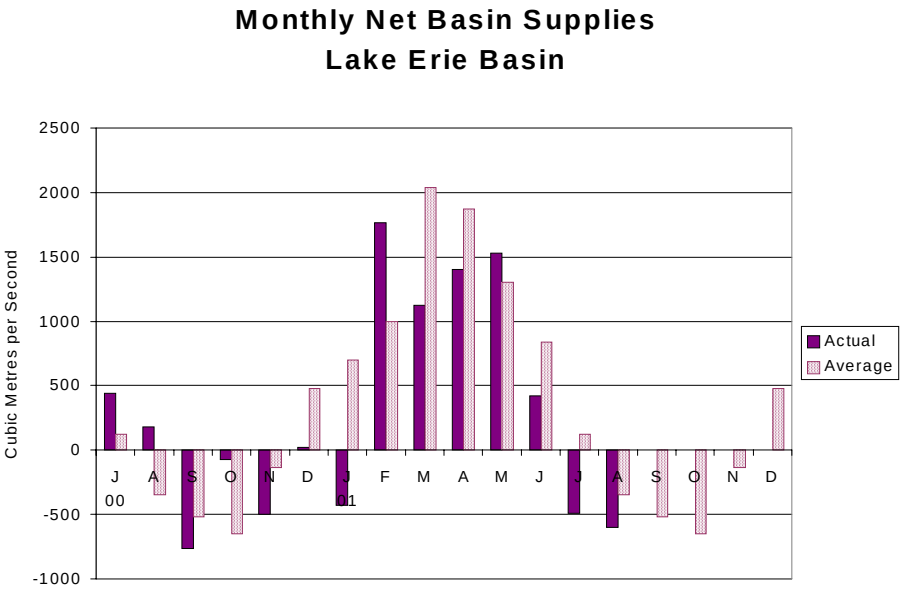

Figure 3

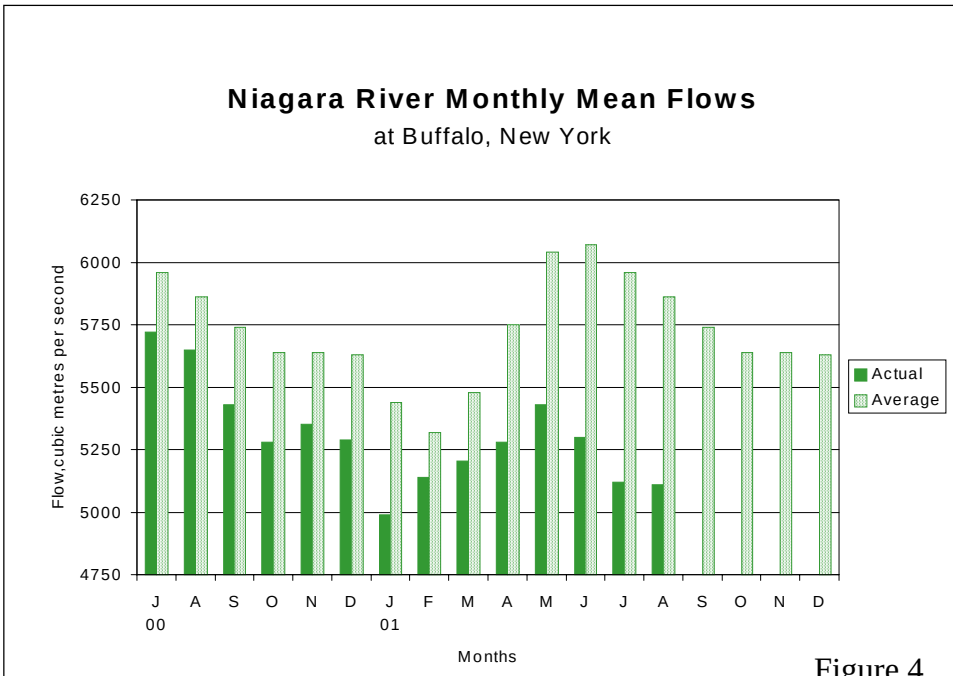

Figure 4

4. OPERATION AND MAINTENANCE OF THE CHIPPAWA-GRASS ISLAND POOL CONTROL STRUCTURE

The water level in the Chippawa-Grass Island Pool is regulated in accordance with the Board's 1993 Directive. The Directive requires that the Power Entities operate the Chippawa-Grass Island Pool (Pool) control structure to ensure the maintenance of an operational long-term average pool level of 171.16 metres (561.55 feet) to ameliorate adverse high or low water levels in the pool. The Directive also establishes certain tolerances for the pool's level as measured at the Material Dock gauge. The Power Entities complied with the Board's Directive throughout the reporting period.

The accumulated deviation of the pool's level from March 1, 1973 through August 31, 2001 was 0.85 metre-month (2.79 foot-months) above the long-term average elevation. The maximum permissible accumulated deviation is 0.91 metre-month (3.00 foot-months).

Tolerances for regulation of the Chippawa-Grass Island Pool levels were suspended on March 16 to assist in ice management in the Chippawa-Grass Island Pool. In addition, tolerances were suspended April 24 through 27 while discharge measurements were conducted at the Cableway Section.

Repairs to seals on gate 14 of the control structure, originally scheduled for the spring of 2001, were deferred. Instead, replacement of gate seals, concrete repairs to the gate apron and a major overhaul of the hydraulic system were undertaken on gate 3 beginning in April. These will be completed by the

end of September at which time work to replace seals will begin on gate 14. The repairs to gate 14 will be completed by the end of 2001.

During the reporting period, a new, dedicated power supply to the control structure was installed.

Recorded daily Material Dock water levels covering the period March 8 through August 31, 2001 are shown in Enclosure 1. The locations of the water level gauges on the Niagara River are shown in Enclosure 2.

5. FLOWS OVER NIAGARA FALLS

During the tourist season daylight hours, the required minimum Niagara Falls flow is 2832 cubic metres per second (m^3/s) (100,000 cubic feet per second (cfs)). At night and during the winter months, the required minimum Falls flow is 1416 m^3/s (50,000 cfs). The operation of the Chippawa-Grass Island Pool control structure, in conjunction with power diversion operations, ensures sufficient flow over the Falls to meet the requirements of the Niagara Treaty of 1950.

A series of discharge measurements were conducted at the Cableway Section in April. In order to provide a range of Maid-of-the-Mist Pool outflows requested by the Board, Falls flows were below minimum Treaty requirements as follows:

DATE	HOUR ENDING	FALLS FLOW	MINIMUM
APRIL 25	23:00	1404 m3/s (49,580 cfs)	1416 m3/s (50,000 cfs)
APRIL 26	8:00	2723 m3/s (96,160 cfs)	2832 m3/s (100,000 cfs)
APRIL 26	9:00	2616 m3/s (92,380 cfs)	2832 m3/s (100,000 cfs)
APRIL 26	10:00	2573 m3/s (90,860 cfs)	2832 m3/s (100,000 cfs)
APRIL 26	11:00	2578 m3/s (91,040 cfs)	2832 m3/s (100,000 cfs)
APRIL 26	12:00	2573 m3/s (90,860 cfs)	2832 m3/s (100,000 cfs)
APRIL 26	13:00	2563 m3/s (90,510 cfs)	2832 m3/s (100,000 cfs)
APRIL 26	14:00	2573 m3/s (90,860 cfs)	2832 m3/s (100,000 cfs)
APRIL 26	15:00	2587 m3/s (91,360 cfs)	2832 m3/s (100,000 cfs)
APRIL 26	16:00	2583 m3/s (91,220 cfs)	2832 m3/s (100,000 cfs)
APRIL 26	17:00	2583 m3/s (91,220 cfs)	2832 m3/s (100,000 cfs)
APRIL 26	18:00	2592 m3/s (91,540 cfs)	2832 m3/s (100,000 cfs)
APRIL 26	19:00	2592 m3/s (91,540 cfs)	2832 m3/s (100,000 cfs)
APRIL 26	20:00	2810 m3/s (99,230 cfs)	2832 m3/s (100,000 cfs)

Falls flows met or exceeded minimum Treaty requirements at all other times during the reporting period. The recorded daily flows over Niagara Falls, covering the period March 8 through September 19, 2001 are shown in Enclosure 3.

6. DIVERSIONS AND FLOW AT QUEENSTON

Diversion of water from the Niagara River for power purposes is governed by the terms and conditions of the 1950 Niagara Treaty. The Treaty prohibits the diversion of Niagara River water that would reduce the flow over Niagara Falls to below the amounts specified for scenic purposes.

The high head hydro power plants, OPG's Sir Adam Beck 1 and 2 in Canada and NYPA's Niagara Power Project in the United States, withdraw water from the Chippawa-Grass Island Pool above Niagara Falls and discharge it into the lower Niagara River at Queenston, Ontario and Lewiston, New York, respectively.

During the period March through August 2001, diversion flows for the Sir Adam Beck 1 and 2 plants averaged a total of 1496 m^3/s (52,830 cfs) and those by the Niagara Power Project averaged 1582 m^3/s (55,870 cfs).

The low head hydro power plant, Canadian Niagara Power's (CNP) Rankin Plant, diverts water from the Cascades, just upstream of the Horseshoe Falls, and discharges it into the Maid-of-the-Mist Pool. Since the operating efficiency of this older plant is much lower than those of the high head plants, water that is

available for power generation is normally dispatched on a priority basis to the high head plants, with the excess being directed to the low head installation.

During the period March through August 2001 diversion flow for the CNP Rankin plant averaged 19 m^3/s (670 cfs).

The Ontario Power Generating Station, located on the Canadian shore, downstream of the Horseshoe Falls, was taken out of service on November 26, 1999.

The average flow from Lake Erie to the Welland Canal for the period March through August 2001 was 247 m^3/s (8,720 cfs). Diversion from the canal to OPG's DeCew Generating Stations averaged 182 m^3/s (6,430 cfs) for the period March through August 2001.

Records of Niagara River diversions for power generation covering the period March through August 2001 are shown in Enclosure 4.

The monthly average Niagara River flows at Queenston, Ontario for the period March through August 2001 were:

March	5312 m^3/s	(187,590 cfs)
April	5394 m^3/s	(190,490 cfs)
May	5466 m^3/s	(193,030 cfs)
June	5315 m^3/s	(187,700 cfs)
July	5117 m^3/s	(180,700 cfs)
August	5114 m^3/s	(180,600 cfs)

During this period, the flow at Queenston averaged 5286 m^3/s (186,670 cfs). Flows averaged 5484 m^3/s (193,670 cfs) during the previous year for the period March through August with the monthly averages ranging between 5090 m^3/s (179,750 cfs) and 5725 m^3/s (202,180 cfs).

7. GAUGING STATIONS

The Niagara River gauges used to monitor the Chippawa-Grass Island Pool levels and flows over Niagara Falls are Slater's Point, Material Dock, American Falls and Ashland Avenue gauges (see Enclosure 2). All gauges required for the operation of the Chippawa-Grass Island Pool control structure were in operation during the reporting period.

A power failure made the Ashland Avenue gauge readings unavailable for a period of two hours on April 14 and a mechanical problem was encountered for two hours on June 30 and a three hour period on August 31. The Ontario Power Generating Station tailwater gauge was used to determine Falls flows at those times.

Frenchman Creek gauge readings were unavailable from 09:00 hours on July 19 through to 13:00 hours on July 30, from 15:00 hours August 13 through 11:00 August 14 and again from 13:00 hours August 22 through to 10:00 August 27 due to communication failures or equipment problems. These outages did not impacted the Control Structure's operations as the gauge is used

primarily, along with other gauges on both the Chippawa and Tonawanda Channels, in the early warning system used to monitor water levels that can indicate flow impediment from ice stoppages/jams.

Both the U. S. National Oceanic and Atmospheric Administration and the Power Entities operate water level gauges at the Ashland Avenue location. Subject to continuing comparison checks of the water level data from both instruments by the International Niagara Committee (INC), the Power Entities' gauge is used for officially recording water levels used in determining the flows over Niagara Falls. Comparison of water level readings from both gauges showed that they were within acceptable INC tolerances throughout the reporting period.

NYPA is continuing its effort to assess possible measures that might be used to stabilize the riverbank near the Ashland Avenue gauge. A bathymetric survey was completed during this reporting period. The next step will be an engineering feasibility study. From this study, preliminary designs, material requirements, the construction feasibility, and costs for several alternatives will be developed. After this preliminary evaluation of possible mitigating measures is completed, NYPA will meet with OPG to discuss the costs and benefits. Based on those discussions, a decision will be made about whether and when any remedial work should be undertaken to ensure the long-term operation of the gauge.

Ontario Power Generation will complete an upgrade of the Ontario Power Generating Station tailwater gauge prior to the 2001-2000 ice season to increase its reliability during ice conditions. This gauge is used as a back-up to

the Ashland Avenue Gauge during ice free conditions and as an indication of flow restriction in the Maid-of-the-Mist Pool caused by ice jamming/shifting.

8. FLOW MEASUREMENTS IN THE NIAGARA RIVER AND WELLAND SHIP CANAL

Discharge measurements are regularly scheduled in the Niagara River and Welland Canal as part of a program to verify the gauge ratings used to determine flows in these channels for water level management. Most recently, flow measurements were conducted in the Welland Canal on March 19 through 22, 2001 and at the Cableway Section, on the Niagara River downstream of the Falls, on April 24 through 27, 2001. All measurements were obtained through joint efforts of the United States Army Corps of Engineers and Environment Canada.

Data is presently being analyzed and a report will be prepared for the Welland Canal measurement program.

For the Cableway measurements, as requested by the Board, Ontario Power Generation and the New York Power Authority maintained flows as steady as possible past the Ashland Avenue gauge site and through the high head power plants.

Eight conventional measurement sets were taken using standard current metering from the cable car. Two sets being made at the low flow range near 1416 m^3/sec (50,000 cfs) and the remainder being made near 2832 m^3/sec

(100,000 cfs). An Acoustic Doppler Current Profiler (ADCP) was used to take 274 measurements, concurrent to the conventional measurements, to test the suitability of using the ADCP method at the Cableway site. An ADCP unit was suspended at a fixed depth from an outboard powered launch. One traverse of the river took about five minutes, while four hours were needed to make one conventional measurement.

A draft report has been prepared on these measurements which concludes that, based on the entire set of conventional discharge measurements since 1981, there is no statistical justification for either abandoning or adjusting the 1981 equations. More data is required to evaluate the apparent trend of the rating to under-estimate flow at higher stages. The report recommends that discharge measurements continue to be made at regular intervals to verify the 1981 rating equations.

With regard to the ADCP measurements, although having a wide spread when taken individually, when averaged over periods of as little as 30 minutes they came within acceptable tolerance for discharge measurements. Using the ADCP, an abundance of data can be collected in a relatively short period of time with easy set-up and less labour required. Also, because very little time is needed to take a measurement, it could be possible to make measurements while the power plants operate normally as opposed to requiring them to follow the current uneconomical practice of holding the plant flows steady for several hours at a time.

The report recommends that, because of the spread of data gathered by the ADCP, averages of specific periods or number of measurements be

considered as one measurement. Also, ADCP measurements in the low flow range should be taken in the non-tourist season daylight hours, which is a more desirable time for boat operations.

To further assess the use of the ADCP method at this location, ADCP measurements are being planned for the fall of 2001. No changes in the normal operation of the power plants will be requested. Additional measurements may also be made in the spring and summer of 2002. If ADCP measurements continue to provide acceptable results, they may, possibly after the 2004 measurements, replace the conventional method of discharge measurement at the Cableway Section.

The next regularly scheduled measurement of the discharge at the Cableway Section for flow rating verification will be in 2004.

9. POWER PLANTS

a) New York Power Authority

Upgrade of eight of the thirteen units at the Robert Moses Niagara Power Plant has been completed. The most recent upgrade was to Unit 12 which began in November, 2000 with the unit returned to commercial service in August 2001. Unit 7 will be the next upgraded with the schedule calling for a February 2002 start with completion in October 2002.

b) Ontario Power Generation

To date, nine of the sixteen units at the Sir Adam Beck II Generating Station have been rehabilitated (including runner replacement). Upgrade to Unit 24 began in October 2000 and was completed in May 2001. Upgrade to Unit 23 began in March 2001 and is scheduled to be completed in November.

The upgrades and expansions by the Power Entities will not affect the regulation of the Chippawa-Grass Island Pool water levels as governed by the International Niagara Board of Control's Directive. In addition, they will not require any modifications to other rules or regulations (such as the 1950 Niagara Treaty) relating to the diversion of water for operation of the projects.

10. ICE CONDITIONS AND ICE BOOM OPERATIONS

The month of March was characterized as cold and snowy with the average monthly Buffalo temperature being 1.3 ^{o}C (2.5 ^{o}F) below the normal of +0.8 ^{o}C (33.6 ^{o}F). The highest daily temperature for March was only 10 ^{o}C (50 ^{o}F) which was the lowest maximum for March since temperature records have been kept at the Buffalo airport (1943). Sunshine during March 2001 was scarce with 27 per cent of the possible sunshine received for the month being the lowest ever for March. The normal for March is 43 per cent. These factors combined to reduce the rate of dissipation of ice on Lake Erie.

Ice thickness measurements were taken at six sites within the eastern portion of Lake Erie's eastern basin on March 12 with the average thickness

being 28 centimetres (11 inches). An ice observation flight on March 20 revealed that the eastern basin had 3700 square kilometres (1,400 square miles) of ice cover remaining. Based on RADARSAT data, this was determined to have reduced to 3160 square kilometres (1,200 square miles) by March 30. Considering the amount of ice remaining in the eastern basin and the ice build-up in the Maid-of-the-Mist Pool below Niagara Falls, the International Niagara Board of Control informed the International Joint Commission that opening of the ice boom would be delayed beyond April 1.

Buffalo's weather in April 2001 was mild and very dry. It was the driest April in 66 years. The average temperature of 8.5 ^{o}C (47.3 ^{o}F) was 1.1 ^{o}C (2.0 ^{o}F) warmer than normal for the month. There were a couple of warm spells with the first seeing a record temperature for April of 26.7 ^{o}C (80.0 ^{o}F) being set on April 12 and 26.1 ^{o}C (79.0 ^{o}F) reached on April 23.

An ice observation flight on April 5 showed that the eastern basin had 2460 square kilometres (950 square miles) of ice cover remaining. Sustained winds from the south-west on April 12 acted to shift this ice away from the south shore with much of it being packed into the extreme eastern end of the lake. Small amounts of rotten lake ice passed around the eastern end of the boom or through the Buffalo Harbor and entered the river. This ice passed downstream without causing any problems.

Unfavourable weather conditions prevented further monitoring flights until April 14. On that date, observations resulted in the determination that only about 390 square kilometres (150 square miles) of ice remained. Considering the amount and deteriorated condition of this ice and the absence of an ice bridge in

the Maid-of-the-Mist Pool (the bridge had broken apart and moved downstream on April 6), Board representatives decided that preparations for removal of the boom would begin on April 16 with actual span opening scheduled to start on April 17.

Following the April 16 issue of notification, ice boom opening and removal commenced on April 17 with 5 spans opened and left trailing. An additional 5 spans were opened on April 18 and were also left trailing. Heavy ice floes through the north entrance to Buffalo Harbor on these days prevented removal of the 10 spans to behind the breakwall. On April 19, 2 more spans were opened and conditions were favourable so that all 12 opened spans were removed. The major phase of ice boom removal was completed on April 20 when the remaining 10 spans were opened and removed so that all spans were tied off at the breakwall. These were subsequently pulled onshore to their summer maintenance/storage area on April 21 and 23.

Increasing amounts of rotten lake ice entered the river as the ice boom was opened. On April 18, large amounts passed through the CGIP with some stoppages at Ontario Power Generation's Beck Intakes. However, no major problems were encountered throughout this period. Lake ice continued to pass through the CGIP over the next several days. Floes were heavy and there was some ice grounding at the upstream end of the American Falls channel. The last remnants of lake ice filtered through the CGIP on April 24. Small amounts of ice remained in the bays on the north shore of Lake Erie between Fort Erie and Crystal Beach until April 27 which is considered the date of last ice.

Floatation barrels were removed from the lake on April 25 and 26, completing this year's ice boom operation. The Buckhorn barge, placed each winter to prevent ice from the Chippawa Channel passing between Buckhorn Island and the Buckhorn Dykes and reducing the amount of ice directed towards the NYPA intakes, was removed on May 2.

At various times, a combination of the Power Entities' ice breaker activity, reduction in diversions and manipulation of the CGIP level was required during the 2000-2001 winter to assisted in moving ice past the power plants' intakes. Tolerances for operation of the CGIP were suspended for one day in January, three days in February and two days in March when the Pool level was manipulated to assist in ice passage.

This is the first season since the 1996/1997 ice season that helicopter (thickness) and fixed-wing (area) observation flights were conducted.

11. PEACE BRIDGE

In response to a November 9, 2000 request from the Buffalo and Fort Erie Public Bridge Authority (PBA), the International Joint Commission, by letter dated December 11, 2000, withdrew its Orders of Approval dated April 30, 1999 and modified on December 28, 1999. These Orders were for modification of the existing Peace Bridge over the Niagara River between Fort Erie, Ontario and Buffalo, New York, and construction of a parallel multi-span steel arch bridge. Local issues regarding the new bridge design and the review process led to a New

York State Supreme Court order for an environmental review combining proposals for bridge capacity expansion with the design of a new U.S. Plaza.

The PBA have initiated a Bi-National Integrated Environmental Process. This is a planning process, with emphasis on public involvement, to consider capacity expansion of the Peace Bridge, U.S. Plaza and improvement of the connecting roadway system. It will include consultation with federal, state, provincial and local agencies regarding environmental screening/assessments as well as public meetings and workshops on a number of bridge-related issues.

The preliminary schedule proposes up to two years for the planning and environmental review, a further two years for design, permits and related work, and then up to four years of construction.

12. MEETING WITH THE PUBLIC

In accordance with the Commission's requirements, the Board held an annual meeting with the public. The meeting for 2001 took place in Fort Erie, Ontario on September 19. Six members of the public were in attendance. Information on current and projected Great Lakes levels, the current Public Bridge Authority undertaking and the operation of the Lake Erie-Niagara River Ice Boom was provided. This was followed by informal discussions with Board representatives on various topics. These included International Great Lakes Datum, performance of the ice boom's steel pontoons, the Long Lac, Ogoki and Chicago diversions and water exports.

13. MEMBERSHIP OF THE BOARD

Brigadier General Steven R. Hawkins replaced Brigadier General Robert H. Griffin on July 24, 2001 as Chair of the U.S. Section of the Board. Mr. Randy Crissman of the New York Power Authority became its Region Manager for northern New York. He was replaced on the U. S. Section of the International Niagara Working Committee by Mr. Doug Harding, also from the Power Authority.

The remaining membership of the Board and its International Niagara Working Committee is unchanged.

14. ATTENDANCE AT BOARD MEETINGS

As the result of the tragic events of September 11, the Board meeting scheduled for September 19 in Fort Erie, Ontario was cancelled. Instead, the Board held a teleconference call on the morning of September 20. All Board members and the alternate U.S. Chair participated in the call.

Respectfully Submitted,

DOUG CUTHBERT	BRIGADIER GENERAL STEVEN R. HAWKINS
Chair, Canadian Section	Chair, United States Section
DAVID de LAUNAY	CONSTANTINE G. TJOUMAS

Member, Canadian Section

Member, United States Section